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INVESTIGATING TV DISTRIBUTION OF VISUAL AIDS ON THE UNIVERSITY OF UTAH CAMPUS VIA LOW-POWER UHF.

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OVER A 3-YEAR PERIOD, FROM JULY 1960 TO OCTOBER 1963, TELEVISION SETS WERE PLACED IN UNIVERSITY OF UTAH BUILDINGS WHERE EXPERIMENTAL DEPARTMENTS HAD READY ACCESS TO THE SETS. CONTROL DEPARTMENTS WERE SELECTED IN BUILDINGS WHERE NO TELEVISION RECEIVING SETS WERE CAPABLE OF GETTING STATIONS K71AU OR K74AY. FACULTY IN THE EXPERIMENTAL DEPARTMENTS WERE ENCOURAGED TO PREVIEW FILMS AND OTHER VISUAL MATERIALS, TO RECORD SPECIAL DEMONSTRATIONS ON VIDEOTAPE TO BE PLAYED BACK AS PART OF THEIR REGULAR CLASSROOM PRESENTATION, AND TO USE TELEVISION SETS IN THEIR CLASSROOMS FOR PRESENTING VISUAL MATERIAL IN LIEU OF THE MORE TRADITIONAL METHODS. FOUR HYPOTHESES WERE STATED--(1) THERE WOULD BE AN INCREASE IN THE FREQUENCY OF USE OF VISUAL AIDS BY INSTRUCTORS HAVING TELEVISION AVAILABLE AS A VISUAL AID, (2) USE OF THE LOW-POWER UHF-TV STATION AS A MEDIUM FOR DISTRIBUTING VISUAL AIDS WOULD NOT CREATE MORE PROBLEMS THAN ARE SOLVED BY SUCH USE, (3) TEACHERS AND STUDENTS WOULD HAVE A MORE FAVORABLE ATTITUDE TOWARD TELEVISION AS A VISUAL AID THAN AS A MEDIUM FOR TOTAL INSTRUCTION, AND (4) COLLEGE TEACHERS WOULD HAVE A FAVORABLE ATTITUDE TOWARD INSERVICE TRAINING OFFERED OVER TELEVISION FOR VOLUNTARY USE. ALTHOUGH FOUR HYPOTHESES WERE PRESENTED, NONE WAS TESTED. (LP)

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SALT LAKE CITY, UTAH, 1964

Investigating TV Distribution of Visual Aids on the University of Utah Campus Via Low-Power UHF

By KEITH M. ENGAR and OAKLEY J. GORDON

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Final Report of a Research Project Supported
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by Keith M. Engar
Oakley J. Gordon

Final Report of a Research Project
Supported by a Grant from the
U.S. Department of Health, Education and Welfare
Office of Education
The University of Utah, A. Ray Olpin, President

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KUED Crew and K71AU *and K74AY Crew*	

TABLE OF CONTENTS

page

ACKNOWLEDGMENTS 4

PURPOSE OF THE PROJECT 5

ABSTRACT 5

RESEARCH DESIGN 6

RESULTS 7

Hypothesis I 7

Hypothesis II 14

Hypothesis III 15

Hypothesis IV 25

SUMMARY AND CONCLUSIONS 29

APPENDIX 33

ACKNOWLEDGMENTS

Many people contributed to this project. President A. Ray Olpin of the University of Utah conceived of the University television facilities as a laboratory to be used for such studies as this, and we acknowledge his active support for the entire project. The Federal Communications Commission through the efforts of Commissioner Rosel H. Hyde made it possible for the University to put on the air the unique low-power UHF facilities K71AU and K74AY which were used for this project. These facilities were a forerunner of the presently authorized multiple address system which will transmit in the 2500 megacycle band. It is our hope that universities will find experience recorded in these pages a guide in establishing uses for the 2500 megacycle system on university campuses.

PURPOSE OF THE PROJECT

In his summary of research on new educational media, W. H. Allen* noted that teacher inertia is one of the chief deterrents to the use of the newer media. The major purpose of this project was to see whether or not teacher inertia on the part of university faculty members could be overcome if a less cumbersome method of distributing visual aids could be developed for the faculty. The University of Utah was uniquely equipped to perform such a study because the Federal Communications Commission had granted the University special temporary authorization to use two 10-watt UHF translators as originating transmitters. Thus was created K71AU operating on channel 71 and K74AY operating on channel 74. The 10 watts of power was sufficient to cover a radius of ten to twenty miles depending upon the antenna pattern used. There was adequate signal to put a high-quality picture into every building on the university campus, given the proper antenna installation. Such ubiquitousness meant that a wide range of choice was given to university personnel in designing a distribution system for visual aids. It should be noted that K71AU and K74AY went on the air before the Federal Communications Commission announced rule making for its multiple address system in the 2500 megacycle band which was specifically designed by Commission engineer Mr. McIvor Parker to fill the kind of needs which the University of Utah wished to be met by channels 71 and 74. Since it is possible to have several channels in one locality through the 2500 megacycle system, one can see that visual aids may be distributed from a central point on the campus to any room in the campus equipped to receive the signal. Therefore, results of this project should be useful to administrators in planning future teaching facilities on university and college campuses.

Another purpose of this study was to explore student and teacher attitude toward television in the classroom when the medium is used as another visual aid instead of serving to present the entire lecture. Part of the attitude study involving faculty members involved a modest project at in-service training for teachers on the college level. Traditionally hostile to in-service training, would the professor be more inclined to explore new teaching methods if he were able to view a television program on demand?

ABSTRACT

Over a three-year period from July 1960 to October 1963 television sets were placed in buildings where experimental departments had ready access

* W. H. Allen, "Research on New Educational Media: Summary and Problems." *Audio-Visual Communications Review*, Vol. 7, p. 88. Spring, 1959.

to the sets. Control departments were selected in buildings where no television receiving sets capable of getting K71AU or K74AY were located. Faculty in the experimental departments were encouraged to preview films and other visual materials, to record on videotape special demonstrations to be played back as part of their regular classroom presentation, to use television sets in their classrooms for presenting visual aids in lieu of the more traditional methods.

Four hypotheses were enumerated:

1. There will be an increase in frequency in the use of visual aids by instructors having television available as a visual aid.
2. Use of the low-power UHF-TV station as a medium for distributing visual aids will not create more problems than are solved by such use.
3. Teachers and students will have a more favorable attitude toward television as a visual aid than as a medium for total instruction.
4. College teachers will have a favorable attitude toward in-service training offered over television for voluntary use.

All hypotheses were supported by this study.

RESEARCH DESIGN

The primary objective of the study was to test the effectiveness of a ubiquitous television facility in stimulating increased use of audio-visual aids.

I. The following controls were initiated:

A. Sets capable of receiving K71AU and K74AY were placed in six buildings: Mathematics, Biology, the Annex, Geography, Milton Bennion Hall, and the Joseph Merrill Engineering Building. Inasmuch as only UHF receivers could receive the signal, placing the sets effectively limited the use of television only to those buildings with sets. Departments using those buildings were termed "experimental."

B. The experimental departments were matched with control departments which had similar kinds of subject matter to the experimental group but which used buildings not equipped to receive K71AU and K74AY. The control groups and experimental groups were also matched according to high, medium, and low past use of audio-visual facilities.

C. A survey of the entire university faculty was made before the study commenced to determine the extent of visual aids use prior to use of television. Certain departments such as physics which already had elaborate visual aids within the department were measured along with those departments who depended upon the Audio-Visual Bureau or other agencies. Records of the Audio-Visual Bureau and logs of K71AU and K74AY were checked throughout the project to determine frequency of faculty use of the UHF facilities.

D. As the study progressed, follow-up surveys were made to determine whether or not there was any increase in the use of visual aids by professors who did not make use of the low-power UHF-TV facilities.

II. *Sampling plan and procedure.* As noted, the designation of experimental faculty members was determined by the buildings in which television sets were placed. Use of television as a visual aid during class was an entirely voluntary matter. Designation of students was determined by faculty use of the UHF television facility.

III. *Data, types gathered and methods used.* A tabulation on each faculty member use of visual aids was obtained from surveys, a log of the UHF facilities, and from Audio-Visual Bureau records. Periodic attitude surveys were made with those professors who used television visual aids and for non-television aids. Students were surveyed on the same basis as professors. Scales were built for these purposes. Faculty and student interest in the use of television as a visual aid was assessed by self-reports and observers. Professors' attitudes toward in-service training for university professors was surveyed before and after the active use of television as a visual aid through scales built for the purpose.

RESULTS

HYPOTHESIS I

There will be an increase in frequency of the use of visual aids by instructors having television as a visual aid.

The results suggested by this hypothesis may be manifested in two ways. Having television available the instructor may now use more visual aids through the television circuit itself, as proposed in the introductory section of this report. However, such use of television by himself or by others may lead the instructor to increase his use of visual aids through the more traditional media also. That is, the introduction of visual aids via television may stimulate the use of visual aids in general. Thus these two manifestations of increased use are certainly related, yet they call for separate indices of results to test the hypothesis. These separate indices and their resulting evidence for this hypothesis will be discussed in turn in subsequent paragraphs.

Further, one may expect the use of visual aids to change in frequency over several years, with or without the presence of instructional television. Therefore, for comparative purposes, the campus was divided into two areas. One area, called experimental, was equipped with UHF-TV receivers. The other area, termed the control, was not so equipped. These areas were matched in terms of types of departments and past use of audio-visual materials and equip-

ment. As examples of the matching by departments, the experimental group contained seven physical-biological departments such as engineering, mathematics, biology and genetics, and seventeen social science-humanities departments, such as English, psychology, business, and education. The control group consisted of nine physical-biological departments, such as chemistry, physics, geology and nursing, and eight social science-humanities departments, such as home economics, art, anthropology and speech. Similarly, both areas contained high, medium, and low past users of audio-visual facilities.

Of course it would be unrealistic to assume that the individual faculty members of these departments remained such "pure" types, experimental and control, throughout the three years of this research. There were faculty in the control area who were exposed to UHF programs and there were faculty in the experimental area who never were exposed. This is the nature of research in natural settings. Any differences in the frequency of use of visual aids between the experimental and the control groups must occur above and beyond this slight contamination.

The UHF receivers were installed in the appropriate buildings of the experimental group in the fall of 1960. The UHF studios were cleared for broadcasting in the spring of 1961. It was in the fall of 1961 that the faculty at large was first informed by letter that the following new services were available via channels 71 and 74: Films could now be previewed via television in certain buildings, films could be shown in classrooms containing UHF receivers, and kinescope films or videotapes could be prepared by the faculty member for showing in his classes via television. In January and February of 1962 a "short course" in how these three new services could be used was shown repeatedly over K71AU. Again the following spring, May of 1963, another letter was sent to all the faculty giving time schedules in which they could make their own kinescope films. In addition to the above, special previews of new audio-visual materials were scheduled from time to time.

The first index of results to be discussed is the actual use of television for showing visual aids. For purposes of this study, "visual aids" refers to motion picture or videotape. It may well be argued that such a limitation would not give a true index of use of visual aids since slides, transparencies, film strips, etc., are important. However, we found it impossible to keep an accurate check on each use of slides, film trips on the one hand and the overhead television camera on the other. We arbitrarily decided to use motion picture films, kinescopes, and videotape as our index of visual aids use. In the academic year 1960–61, when the UHF facilities were just being tested out, Channel 71 was used seven times by the total experimental group. In 1961–62, the usage jumped

to 47, with more experimental departments joining in. In the final year of the study, 1962–63, there were 79 usages and by now a few control departments had also joined in.

Therefore, there has been an increase in the frequency of use of visual aids via television — by eight experimental departments and three control departments.

The second index of results deals with the more indirect effect of the availability of television upon the use of visual aids. This source of data was provided by the Audio-Visual Bureau of the university. The Bureau keeps a record of all equipment and film checked out by each department. For this project annual records were used for the academic years 1960–61, 1961–62, and 1962–63. The first year serves as a base line for measuring any change in the frequency of use of visual aids, since the UHF-TV studios were not really available until the following year. Figures 1 and 2 show the three-year records

FIG. 1. SOCIAL-HUMANITIES USE OF AUDIO-VISUAL AIDS

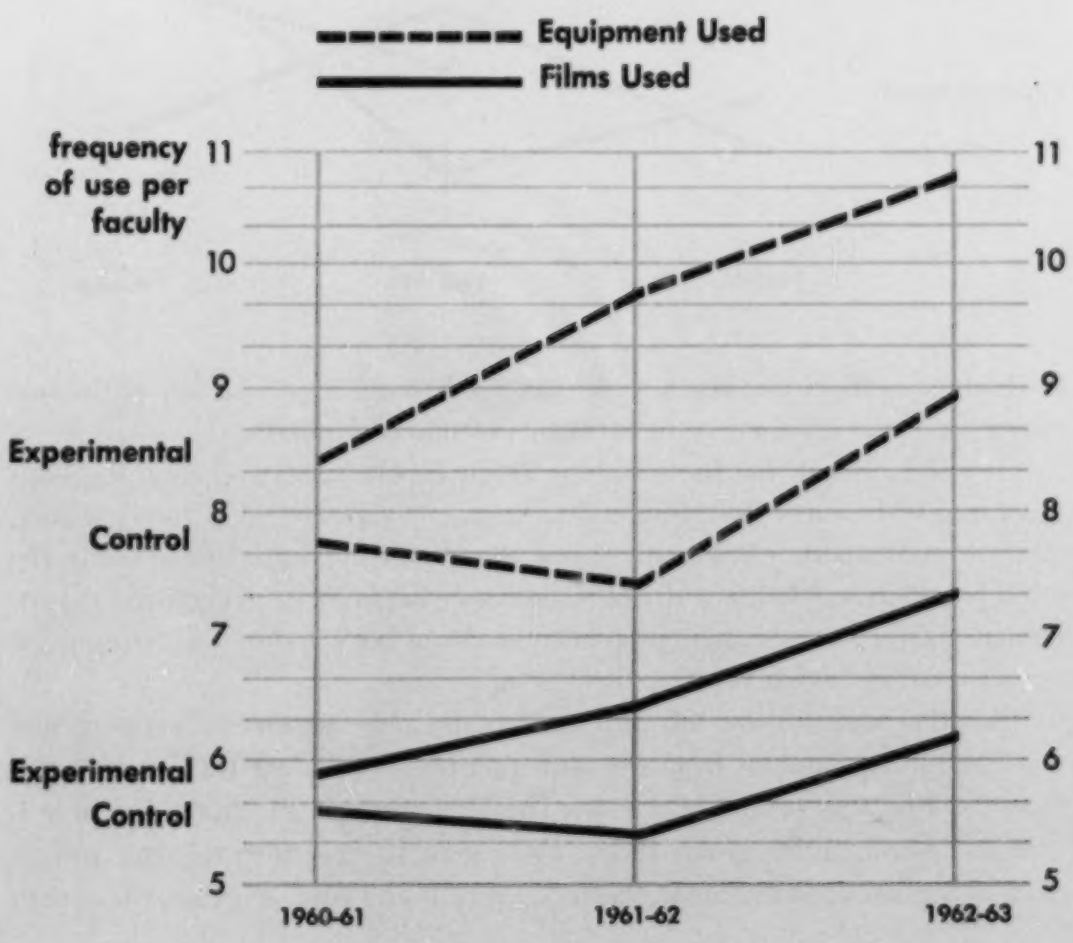
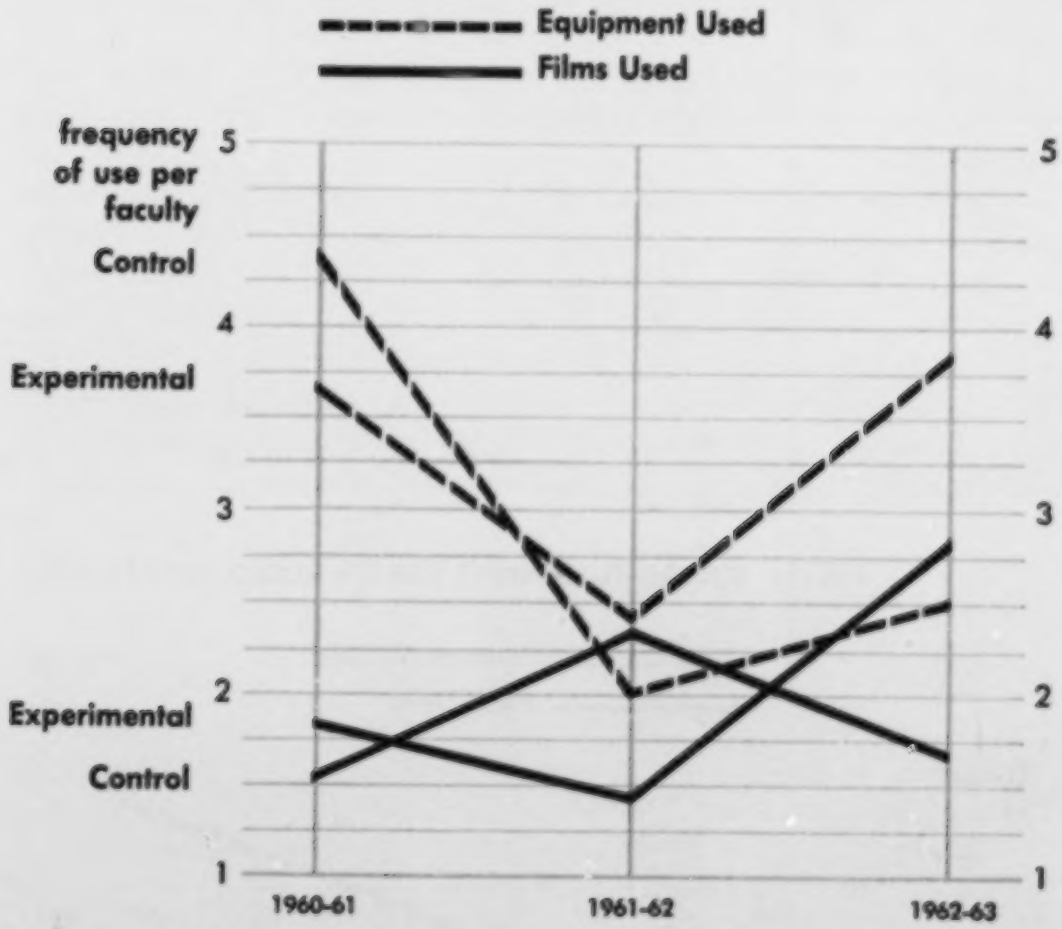


FIG. 2. PHYSICAL-BIOLOGICAL USE OF AUDIO-VISUAL AIDS



for both equipment and motion pictures checked out by the faculty of the two major curricular divisions of the experimental and control areas.

It will be noted that the matching of the experimental and control groups according to frequency of visual aid usage was not perfect. For the base year, 1960-61, the experimental and control groups do not start from exactly the same point. Nevertheless a definite trend can be seen. In general the experimental groups increase their frequency of use of both audio-visual equipment and material more than do the control groups.

Another way to show this differential gain, and also start the experimental and control departments from the same point, is to calculate the per cent gain from the first year to the third year. These percentages are shown in Table 1. The social-humanities group shows more gain in experimental departments than in control departments for both equipment and film. Further, the experi-

TABLE 1

Per Cent Gain or Loss in Use of Audio-Visual Equipment and Materials

Group	*Equipment Per Cent Gain*	*Equipment Per Cent Loss*	*Film Per Cent Gain*	*Film Per Cent Loss*
Social Science-Humanities				
Experimental	27		24	
Control	15		8	
Physical-Biological				
Experimental	3		54	
Control		43	11	

mental area of the physical-biological group shows a sizable gain in use of film, while the control area shows a loss in equipment usage.

There are two points of caution to mention, however, in interpreting these data from the Audio-Visual Bureau. One point is that television may have become a substitute for the Bureau's facilities, particularly in the use of equipment. This is difficult to determine in group results. Among departments which used television fairly often, it can be noted in Table 2 (p. 12) that the College of Business did indeed *decrease* their use of the Audio-Visual Bureau and *increase* their use of UHF-TV. Yet there were other experimental departments, such as psychology and biology, which increased both their use of television and of Audio-Visual Bureau facilities.

The other point of caution is that some departments obtain audio-visual supplies from sources other than the Bureau. They may either own their equipment and material or rent them from outside sources. To check on this possibility a third index of results was utilized. A card was prepared on which an individual faculty member could indicate his frequency of use of various audio-visual techniques in a typical quarter. A card was given to each faculty member at the annual faculty breakfast in the fall quarter of 1960. Each member was encouraged to fill out the card and turn it in at that time. A second card was mailed to each member in the spring of 1963, with a request to fill it out and mail it back.

The data from the individual faculty cards differ somewhat from the above results. The results from these cards, however, must be viewed with the knowledge that the data are less complete. Of the cards distributed at the faculty

TABLE 2

Some Departments Using UHF-TV for Visual Aids: A Comparison of This Use with That of Audio-Visual Bureau Use

Departments	*1960–61*	*1961–62*	*1962–63*
Experimental Departments			
College of Business:			
Channel 71	0	19	2
Bureau Film	44	1	11
Bureau Equipment	120	12	26
Biology:			
Channel 71	2	1	10
Bureau Film	0	14	14
Bureau Equipment	0	27	19
Geography:			
Channel 71	1	4	21
Bureau Film	226	237	212
Bureau Equipment	11	32	34
Journalism:			
Channel 71	4	6	0
Bureau Film	10	4	17
Bureau Equipment	93	22	40
Psychology:			
Channel 71	0	4	17
Bureau Film	77	70	109
Bureau Equipment	115	157	213
Zoology:			
Channel 71	0	0	7
Bureau Film	11	20	36
Bureau Equipment	3	0	12
Control Departments			
Art:			
Channel 71	0	0	5
Bureau Film	151	166	126
Bureau Equipment	134	177	169
Music:			
Channel 71	0	1	5
Bureau Film	10	14	56
Bureau Equipment	20	17	52

breakfast in 1960, 68% were filled out and turned in. From the follow-up mailing in 1963, only 29.5% were returned completed. The bias of non-return is not known in this instance. Table 3 gives the per cent gain or loss of individual faculty use of motion pictures.

From the data in Table 3 it is apparent that *both* the experimental groups gained in the use of motion pictures during this three-year period while the control groups actually lost some use.

The other audio-visual techniques listed on the individual faculty cards also show some interesting changes, although they are less directly related to any effect of the availability of UHF-TV. The experimental departments showed an increase in the use of slide projection and opaque projection, while the control departments showed an increase in use of filmstrip projection. Incidentally, all departments reported more overhead projection and less audio tape recording playback.

Thus from all three indices of results, one direct and two indirect, it can be concluded that Hypothesis I has been supported. The experimental group as a whole did increase the frequency with which they used visual aids, both directly through the UHF-TV facilities and in the more traditional manner. This increase was greater than that shown by the control departments. However the use of television for visual aids is also beginning to spread to the control areas, which is quite desirable now that the project is completed.

It should be noted that the conclusions drawn about this hypothesis are limited to the departments involved. The results are descriptive more than inferential. Although it was originally planned to apply inferential statistics and tests of significance to the results of this hypothesis, the number of departments using television is still so small at this point of time and the treatment

TABLE 3

Per Cent Gain or Loss in Use of Motion Pictures

Group	*Per Cent* Gain	Loss
Social Science-Humanities		
Experimental	21	
Control		5
Physical-Biological		
Experimental	65	
Control		18

groups are accordingly so unbalanced in number that such statistical tests would have been unjustified. Suffice it to say that we know of no other non-chance factors, beyond the introduction of UHF-TV, that can account for the reported increase of use of visual aids by the departments designated as "experimental" at the beginning of the study.

HYPOTHESIS II

Use of the low-power UHF-TV station as a medium for distributing visual aids will not create more problems than are solved by such use.

There seems to be no doubt that this hypothesis was strongly supported. In fact the UHF-TV station solved more problems than it created. The evidence for this support is largely experiential and anecdotal. As explained in the initial proposal for this project, the data for this hypothesis were not to be collected in the form of quantified measurement. Nevertheless, at the end of two years' experience with the UHF facilities a questionnaire was mailed to the faculty who had directly used the studios. Their written responses confirmed our experience completely.

TV receivers strategically placed in the experimental area were generally more available than audio-visual equipment that had to be delivered when needed. One problem which arose however was that, because of a student enrollment which is expanding at a faster rate than the number of classrooms, rooms equipped with UHF receivers were often booked for classes that did not need the receivers. At times this reduced the number of available receivers when they were needed most. This will be solved in time with either more TV sets or more classrooms.

Fortunately, and not without engineering effort, the equipment "always worked well," as one professor wrote us. Audio-visual equipment can be quite frustrating if it does not work well. The UHF-TV equipment did work well and in addition was very flexible. To have both flexibility and efficiency is a rare combination.

One rather unusual "visual" was live elementary-class student behavior which was broadcast to student-teachers in the College of Education. As one professor of education noted, it is becoming increasingly difficult to show schoolroom behavior to the large number of student-teachers needing such observation. The public schools can only endure a limited amount of visitors. The use of TV cameras and the low-power UHF distribution facility solved this problem for them.

While there is nothing unique in teacher observation, having K71AU meant that the College of Education could use television because, incredible though it may seem, there was at the time the service was needed no way cable could be installed to connect the elementary classroom with the Bennion Hall facility. It happens that Bennion Hall was one of the experimental buildings so sets were in the building ready to be used for any purpose, but this does not change the fact that K71AU gave us the flexibility to take a signal wherever we needed it on short notice.

Another somewhat unexpected advantage of showing films over TV instead of using a projector in the classroom is that professors seem more free to edit the films when used on TV. They show only the needed parts of films, omitting the unnecessary footage, when using TV. It is as if they are reluctant to impose this editing on a projectionist who brings the projector to the classroom.

One serious problem arose in the final months of the project which seriously affected the outcome and led to less use of film than would otherwise have been the case. The Audio-Visual Bureau, which had been housed in the same building as the television facility, moved to another building, thus seriously hampering the faculty preview service via televsion. While there was and is wholehearted cooperation between Radio-TV Services and the Audio-Visual Bureau, physical union is almost essential if television is to be used for film distribution. At the University of Utah, we plan ultimately to equip the A-V Bureau with film chains.

In another section, we will describe an outgrowth of this project in which television is used to solve teaching problems on the University of Utah campus.

HYPOTHESIS III

Teachers and students will have a more favorable attitude toward television as a visual aid than as a medium for total instruction.

This phase of the project involved three major considerations: (1) the construction of a scale capable of measuring the attitudes of both teachers and students toward several methods of teaching, including the use of television as a visual aid and television as a medium for total instruction; (2) the measurement of existing stereotypes or attitudes toward the several methods of teaching; and (3) an assessment of any change in attitudes as teachers and students were exposed to the teaching methods under investigation in this study.

Constructing the attitude scales. For comparative purposes, it was felt that attitude scales for this study should be capable of not only measuring attitudes

toward the two teaching methods using television (as a visual aid and for total instruction) but also should permit measurement of attitudes toward the more traditional lecture method and, finally, the lecture method which also utilizes the usual audio-visual techniques. Hence, there were really four teaching methods chosen as the psychological objects for this attitudinal phase. One possible measuring technique that was considered, and dropped, was to have each of these four methods ranked for their efficiency on several dimensions such as holding student interest, clarification of material presented, amount of material learned, etc. This procedure was rejected in favor of a Thurstone type scaling of statements that would be applicable to any of the four teaching methods. The procedures followed were those utilized earlier by H. H. Remmers in his work on generalized attitude scales.

First, statements were collected which represented various degrees of attitude toward teaching methods in general. Fifty-eight such statements were finally chosen which ranged from very positive attitudes toward a given teaching method to very negative attitudes. These statements were given to 180 college students who served as judges. They judged the affective value of each statement on a 1 to 9 scale, with 1 representing the most negative attitude, 5 a neutral attitude, and 9 the most positive attitude. The judges were divided into four equal groups. They all judged the same 58 statements but each group judged a different method of instruction. One group was told that the teaching method which the statements referred to was the lecture method. A second group was told that the teaching method was the lecture method with supplementary audio-visual material. A third was told that it was the lecture method with supplementary use of television, and the fourth group was told that the teaching method was that of total television. For each item, the mean and the standard deviation of the judgments of these students were calculated. We were interested in discovering if there would be a difference in the mean judgment given to a statement if the statement referred to one of the four particular methods. In general, the mean and standard deviation of the judgment value for each of these statements did not shift much with a change in the teaching method referred to. From the total group of 58 items, a final list of 25 were chosen. These were the 25 items which would adequately cover the range of affect from 1 to 9, and in addition, which showed virtually no difference in their scale value regardless of which teaching method was under consideration. These statements, along with their mean scale value, are presented in Table 4.

This list of items was now ready to be used as a scale for measuring attitudes about any of the four teaching methods. In the first form of this attitude scale, the 25 items were placed in the order given above on a single

page, and four blank columns were placed along the left side of the items. At the top of each column was the name of one of the four teaching methods. The instructions to those whose attitudes were being assessed were to take one teaching method at a time and check those statements which best described that method. They were then to proceed to the other three columns in turn. This proved to be confusing to the trial respondents. This was the method used by Remmers in his studies, but it apparently led our subjects to attempt a comparison on each statement across the four methods, resulting in a confusion of our purpose. Therefore, four separate pages were prepared. Each

TABLE 4

Scale Values for Attitude Statements

Scale Value	*Attitude Statements*
8.51	1. Is an excellent educational method.
8.26	2. Has great value.
8.12	3. Is highly efficient.
7.97	4. Is a wonderful way of presenting material.
7.67	5. Students can learn much from presentation by this method.
7.62	6. Has much of value to offer.
7.37	7. Makes a subject more enjoyable.
7.20	8. Makes subject matter more interesting.
6.93	9. Is conducive to learning.
6.64	10. Creates fewer problems for the student.
6.15	11. Has some value.
6.14	12. Is of some importance as a teaching method.
4.91	13. Creates no definite like or dislike.
4.91	14. Is no better or worse than other methods.
4.59	15. It doesn't make much difference whether a class is taught by this method or not.
3.27	16. Has more disadvantages than advantages.
2.94	17. Is too inflexible.
2.82	18. Is annoying.
2.39	19. Should be given up for better methods.
2.34	20. Makes the subject matter more boring.
2.16	21. Cannot meet the student's needs.
2.13	22. Is an inferior way of presenting material.
1.41	23. Is absurd.
1.29	24. Is a complete waste of the student's time.
1.09	25. Is the poorest method of all.

page presented a brief paragraph description of the method at the top and was followed on the page by the identical 25 items. The statements of each of the four methods are presented in Table 5.

TABLE 5

Descriptive Statements of Teaching Methods

Lecture Method
This method consists of classroom lectures and discussion with the instructor present in the class. This is the usual method of instruction in college and is familiar to all students.
Lecture Method with Supplementary Audio-Visual Material
This method consists of the usual lecture method but with additional or supplementary presentation through the use of audio-visual devices such as movies, slides, tape recordings, etc.
Lecture Method with Supplementary Use of Television
The usual lecture method but with additional or supplementary presentation of audio-visual aids such as movies, slides, or other prepared material, broadcast over campus television and received on a television set or sets within the classroom.
Educational Television
A presentation entirely through the medium of television; that is, the student watches the lecture over television instead of attending a class in which the instructor is actually present. Homework and reading assignments are the same as in other methods.

Now we had a problem of the sequence of pages. Would there be an order effect such that if one of the methods always appeared first this would distort its rating? To counterbalance this order effect, the four pages were continually shuffled in a random order as they were stapled together.

Existing attitudes. Although an educational television channel has existed on this campus for several years, only a limited number of faculty and students have had an opportunity to utilize this teaching method. Further, the use of television as a supplementary aid to the regular lecture method was becoming available only with the initiation of this present project. Nevertheless it was reasonable to assume that attitudes toward these uses of television for instructional purposes must already exist in the minds of students and faculty alike. One does not need to have had actual experience with a psychological object in order to form an attitude toward it. It was presumed that certain stereotyped perceptions of the various teaching methods were already in existence and could

be measured. Therefore, the four-page questionnaire was administered to samples of faculty and students while the present equipment for UHF was still under construction.

For a sample of faculty attitudes the mailing list of our university faculty was divided randomly into three equal groups. The first of these three groups was mailed the questionnaire. From this mailing seventy of the faculty returned completed questionnaires. For a student sample, the questionnaire was administered directly to classrooms of students enrolled in general education courses. It was felt that such enrollment included students from all majors and colleges of the university. The mean attitude score of the faculty and student groups on each of the four teaching methods are shown in Table 6.

TABLE 6

Attitude Scores of Faculty and Students

Teaching Method	*Faculty*	*Students*
Lecture	6.74	6.78
Lecture with Audio-Visual	7.18	7.38
Lecture with Television	6.83	6.66
Total Educational Television	5.67	4.42

These results can be examined in one of several ways. Remembering that a score of 5 represents a point of psychological neutrality in the attitude toward the teaching method, it can be noted that the faculty had a positive attitude toward all the methods while the students had a slightly negative (that is, below 5) attitude toward total television instruction. For both groups total television received the lowest rating, that is the least positive attitude. The lecture method with audio-visual aids received the highest attitude score for both groups. For the faculty the lecture method with supplementary television came second highest with the regular lecture method slightly below this. On the other hand, the students reversed this ranking of second and third place. Thus even at this early stage of the project it is apparent that Hypothesis III is supported. The teachers and students sampled did have a more favorable attitude toward television as a visual aid than as a medium for total instruction.

Attitude change. The administration of the attitude scale was conducted by several different methods for the assessment of attitude change. These methods ranged from the testing of independent groups at various times and

the testing of groups who had and had not been exposed to television procedures, to the test-retest of subjects who served as their own control in television classes.

It has already been mentioned that the entire faculty had been divided into three random groups for the mailing of the questionnaire. The first group received its questionnaires in the spring of 1962. The second group of the faculty received its questionnaires that following fall, while the third group received its questionnaires at the end of the winter quarter in 1963. Thus these measures were spread across time in order to detect any overall shift in faculty attitude. Since a great majority of the faculty still have not yet personally used television at the time of writing this report, the attitude scores shown in these three time periods can mainly reflect only the effect of rumor and the informal conversations that characterize any university community. The results are shown in Table 7.

TABLE 7

Faculty Attitudes at Three Time Periods

Teaching Method	*Spring 1962*	*Fall 1962*	*Winter 1963*
Lecture	6.74	6.59	6.80
Lecture with Audio-Visual	7.18	7.16	7.22
Lecture with Television	6.83	6.72	6.88
Total Educational Television	5.67	5.32	5.56

It is fairly obvious that no important attitude change took place across these time periods as measured on various segments of the faculty. Certainly the ranking given the four teaching methods did not change. The lecture method with audio-visual aids still ranks highest with total television instruction ranking lowest.

One immediate concern in interpreting the results of such a mailed questionnaire is the nature of the nonresponse. One cannot help worrying that those who did not return the questionnaire have attitudes different from those who did. To test this possibility those persons who did not respond to the fall mailing in 1962 were again mailed a questionnaire. Approximately 30% of those sampled had responded to the first mailing. Another 25% responded to the second mailing. A majority of this second response group filled out the questionnaire and showed attitude scores that were not significantly different from the first mailing; however, there was a tendency for every teaching

method to be rated slightly higher. Those who returned the second mailing, but did not fill out the questionnaire, either said they were not a part of the teaching faculty or replied that the faculty person to whom the questionnaire was addressed was no longer at this university. These results suggest that the nonrespondents were not simply those persons whose attitudes were so negative that they threw the questionnaire in the wastebasket. Thus, the results cited in the above table, although they reflect only about one-third of the faculty sampled, may be considered to be fairly representative of the entire faculty. We may conclude, therefore, that the attitudes of the faculty in general toward these teaching methods did not change significantly across the time period of this project.

Since there were no appreciable differences in the scores obtained in the three different mailing times described above, the total number of questionnaires were combined creating a sample of two hundred and four faculty respondents. These were then grouped into two categories, those faculty who had never used television (n=181) and those members of the faculty who had used television in some form (n=23). The resulting attitude scores of these two categories of faculty are shown in Table 8.

Since these two categories differed so in the number of faculty involved, no statistical comparisons between the two faculty groups were made. However, inspection indicates that those who used television in some form scored higher in all the four methods of teaching. Because this procedure did not use a test on each faculty member before and after his opportunity to use television, we do not know if the faculty who used television were thereby changed to a more positive attitude toward all teaching methods or if this group was already characterized by more positive attitudes toward any teaching method. This latter characteristic could be the reason why this small group chose to experiment with new teaching devices such as television.

TABLE 8

Attitudes of Faculty Who Had and Had Not Used Television

Teaching Method	*Faculty Who Had Used Television*	*Faculty Who Had Not Used Television*
Lecture	7.01	6.70
Lecture with Audio-Visual	7.22	7.20
Lecture with Television	7.21	6.76
Total Educational Television	6.44	5.41

Let us turn now to the analysis of student attitude changes. As the students filled out the attitude scale in classes, they were asked to indicate whether they had been exposed to either total television instruction or to the use of television as a supplementary procedure in regular lectures. From an available supply of completed questionnaires we formed three categories of students — those with no exposure to television in the classroom in any form (n=88), those who had experienced television as a supplementary aid to lectures (n=88), those who had taken a class entirely by television (n=176). The mean attitude scores of these groups toward the four teaching methods are shown in Table 9.

TABLE 9

The Attitudes of Students with Varying Experience

Teaching Method	*Experience*		
	No Educational Television	*Lecture with Television*	*Total Educational Television*
Lecture	6.78	6.56	6.38
Lecture with Audio-Visual	7.38	7.36	7.26
Lecture with Television	6.66	7.17	6.98
Total Educational Television	4.42	4.77	5.80

The mean attitude scores of the non-exposed or control group are identical to those presented earlier under the discussion of existing attitudes and stereotypes. Those who were exposed to total television rated it significantly higher than did the other two groups. However, they did not rate supplementary television significantly different from lecture with audio-visual supplements. Those who were actually exposed to supplementary television did rate this method significantly higher than did those who had not been so exposed. One can conclude then that these students who were exposed to a particular use of television showed an attitude toward that particular method that was significantly more positive than those students who had not been exposed.

Since the stereotype does exist on this campus — and probably other campuses — that television is somehow a less desirable method of instruction compared to regular lectures or lectures with audio-visual material, one could have hypothesized that exposure to these television procedures would result in even less favorable attitudes toward television. The fact that with these students the attitude not only did not become less favorable but instead became more favorable is a notable result. However, it must also be noted that even with

the increase in positive attitude, total television still is rated as the lowest of the four methods, with the lecture utilizing audio-visual helps as the highest method. Would more intensive and prolonged exposure to television change this overall ranking? Only more prolonged studies can answer a part of this question.

As a partial answer to the intensity portion of the above question a more controlled analysis will now be presented. This analysis deals with the responses of students who were actually currently enrolled in one of the television teaching methods. The sample was drawn from two classes which were using total television, from two classes using supplementary television, and from two classes which were using no form of television but covering subject matter similar to the others. Needless to say only students were used from this latter pair of classes who indicated no previous exposure to television teaching. By using the response of students immediately involved in these teaching procedures one might catch a more intense response to the methods. The mean results of this hierarchical design are shown in Table 10.

Each of the cell means in the table below is based on 19 students. The size of the samples was dependent upon the smallest of the classes used. Certain overall results in the above table are similar to those previously discussed. For example, all of the groups as a whole continued to have the most positive attitude toward the lecture method with audio-visual help and the most negative attitude toward the total television method. However, the two classes taking the course by total television rated the lecture method significantly lower than did the nontelevision classes and rated the method of total television significantly higher than did any of the other groups. Further, the two classes who

TABLE 10

Attitudes of Students Currently Experiencing Various Methods of Teaching

	Current Enrollment					
	No Educational Television		*Lecture with Television*		*Total Educational Television*	
Teaching Method	*Class 1*	*Class 2*	*Class 1*	*Class 2*	*Class 1*	*Class 2*
Lecture	6.96	6.80	6.26	6.52	6.36	5.85
Lecture with Audio-Visual	7.22	7.27	7.43	7.36	7.26	7.31
Lecture with Television	6.37	7.22	7.36	7.57	6.97	7.12
Total Educational Television	5.06	4.46	4.99	4.66	5.59	6.29

were currently enrolled in a course using television as a supplement rated that method as significantly higher than did the nontelevision group. In fact, one of these groups currently exposed to supplementary television gave it the highest attitude score. Thus, for the first time we find a television method rated the highest of all four teaching procedures. Again we find then that actual exposure to the use of television, whether for total instruction or for supplementary use, improves the student's attitude toward this medium. And, in this case, for the students whose attitudes were measured while they were actually involved in the methods of presentation, the increase in positive attitude was even more impressive.

Let us now look at the results of a study which utilized a pre- and post-test of student attitudes toward these teaching methods. This sample of students was enrolled in a course which utilized total television instruction one-half the time and the usual lecture method the other half of the time. The class met for two and one-half hours twice a week, Tuesday and Thursday afternoons. The television presentation was on Tuesdays, while the same instructor conducted the class on Thursday with the usual lecture method. The attitude scale toward the four teaching methods was given on the opening day of the class before the students were aware of the fact that half of the course would be on television. The post-test, or the second administration of the questionnaire, occured on the final day of the class. The resulting mean attitude scores across the four teaching methods are presented in the table below.

TABLE 11

Pre- and Post-Measurement of Student Attitudes

Teaching Method	*Pre-Test*	*Post-Test*
Lecture	6.95	6.66
Lecture with Audio-Visual	7.38	7.45
Lecture with Television	6.82	7.18
Total Educational Television	4.47	5.49

It will be noted that the rank order of these four methods remains the same at the end of the quarter, the lecture method with audio visual being rated highest and the total television being rated lowest. However, the attitude of this group toward total television increased significantly. Their attitude toward the use of television as a supplementary device also increased significantly

although this particular method was not used during this course. At the same time, their attitude toward the regular lecture method went down significantly.

In general, concerning Hypothesis III, we find complete support for the statement that teachers and students have a more favorable attitude toward television as a visual aid then as a medium for total instruction. Further, we find that if students are exposed to some form of television instruction their attitudes toward the use of this medium improve. However, their attitude toward television as a supplementary use remains higher than their attitude toward total television instruction. Not enough of the faculty have been exposed to or used television as a teaching device; hence, conclusive statements about their attitude change upon exposure must be more cautious. It can be said that those faculty who did use television have a more positive attitude toward this medium than those who did not.

HYPOTHESIS IV

College teachers will have a favorable attitude toward in-service training offered over television for voluntary use.

In the original proposal for this project, we included as one of our procedures the presentation over the low-power UHF-TV of a short course for the faculty in the use of audio-visual aids. In a sense, this course itself constituted in-service training of faculty over television. However, we were interested in the faculty's general attitude toward all in-service training, a subject much broader than instruction in audio-visual techniques. Therefore, although this short course in the use of audio-visual materials was presented several times, the course was used only for informing the faculty of the services now available to them because of this project. The course remained a device for encouraging faculty participation in the new UHF facilities and was not utilized for answering Hypothesis IV. Therefore, no measurement was made of faculty attitude toward the limited in-service training provided by this course.

To measure the faculty attitude toward the broad topic of in-service training for college teachers, several methods of attitude assessment were considered. In particular we wanted to dissociate the above-mentioned short course, really a form of advertisement, from the topic of in-service training per se. The usual consensus has been that college faculty have a dim view, indeed a negative view, concerning instruction in college level pedagogy.*

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* One of the most recent analyses is that of Dr. Alvin C. Eurich who sharply criticizes college faculties for their indifference to innovation in college level pedagogy. *Educational Record*, Winter, 1964, pp. 49–55.

Frankly, we too expected our faculty to hold such a view and were reluctant to have this view associated with our project. In fact, we were even a bit reluctant to attempt an assessment of this attitude. Of the several assessment devices considered, the method chosen was a one-page questionnaire (shown in Table 12) which was accompanied by a letter from the academic vice president of the university. The letter read as follows:

The University is engaged in the development of low-power broadcast television which will be used for distributing televised instruction and audio-visual materials around the campus. One possible use of the medium could be informal faculty seminars in college level pedagogy. To guide in the formation of such seminars, it would be helpful to have you fill out the attached and return it to O. J. Gordon, Annex 137.

TABLE 12

Name_____ Department_____

What do you think of programs or courses on college level pedagogy?

(Please check the answer or answers with which you agree.)

Such courses can be useful if they deal with . . .	*For any or all of our current faculty*	*For those of our faculty who need this*	*For graduate assistants who will teach*
1. *Subject matter,* enlarging the teacher's knowledge of the topic of the material he teaches	_____	_____	_____
2. *Methods of presentation* such as demonstrations, charts, pictures, etc.	_____	_____	_____
3. *Lecturing,* and speaking to classes	_____	_____	_____
4. *Course planning,* outlining the quarter's work, the classroom hour, etc.	_____	_____	_____
5. *Student-teacher relations,* how to relate yourself to students	_____	_____	_____
6. *Learning theory,* and the conditions under which learning best takes place	_____	_____	_____
7. *Examinations,* making tests and grading student performance	_____	_____	_____

It will be noted that this letter was carefully phrased to provide attitudinal information directly relevant to Hypothesis IV. By having it issued from the office of the vice president, we hoped to give this request for attitudinal information a high enough endorsement to offset some of the negative reactions solicited in even asking such a question. An examination of Table 12 will indicate that seven different phases of in-service training for faculty were considered. This questionnaire was simply scored by giving a weight of 3 for a check mark occurring in the column "for any or all of our current faculty"; a weight of 2 for a check under the column "for those of our faculty who need this"; a weight of 1 for a check under the column "for graduate assistants who will teach"; and finally a weight of 0 for any nonresponse.

Replies were received from 26% of the faculty. As anticipated, most of the seven kinds of in-service training received less than an enthusiastic report from these respondents and yet two of these seven were viewed as being fairly useful subjects for in-service training. The rank ordering of these seven subtopics was as follows:

1. Learning theory 2.27
2. Examinations 2.00
3. Methods of presentation 1.95
4. Lecturing 1.89
5. Student-teacher relations 1.80
6. Course planning 1.52
7. Subject material 1.42

The numbers in the left-hand column are by rank order from 1, most preferred, to 7, least preferred. The numbers in the right-hand column represent averages across the faculty responses using the score system described above as ranging from 3 to 0. From these averages, one can infer that members of this faculty feel that any future instruction on "subject matter" should be restricted mainly to graduate assistants and possibly a few faculty who need this. However, it will also be noted that they feel that instructions in "examinations" would be useful to at least some of the faculty and that future discussion of "learning theory" could be extended to nearly all of our faculty. It would appear then that certain in-service training programs would be well received through the facilities of our UHF television station. This finding was both informative and encouraging to us and might possibly be useful to other universities.

In view of the above results, interviews were conducted with members of the faculty whose experience would qualify them for giving televised instruc-

tion in either learning theory or examinations. From these interviews, it was determined that the most immediate and feasible instructional television program would be in the area of examinations. Therefore, a half-hour program was prepared using the experience of Dr. William Cagle on the subject of Evaluating Multiple Choice Examinations.

As a professor of chemistry, Dr. Cagle had handled the problem of validly testing large classes by turning to the services of high-speed computers. He had written a computer program that provided feedback after every exam to the students and to himself. The student received back a card containing his own answers and the right answers. The instructor received an item analysis for the choices in every question and a statistical summary of the results.

The TV program was prepared to show faculty that this mechanized method was available and, possibly more importantly, to show them the value of item analysis. At the date of this writing the videotape of this program has been shown at three successive noon hours. So far five per cent of the faculty have voluntarily sought out a UHF receiver and watched the program. Each has been asked to fill out a questionnaire at the close of the showing. The response has been very favorable. Of course these are faculty who were interested enough to watch the program after they read an announcement concerning it. But of equal importance to this hypothesis, none of the faculty at large has criticized us (good naturedly or otherwise) for presenting such a subject. Apparently our earlier survey was correct in indicating that this faculty would respond favorably to "college level pedagogy" if it was confined to such a topic as examinations.

More specifically the replies of those who have watched this program say that it should be presented to "all the faculty" or "some faculty." Only three respondents thought the program should be shown just to teaching assistants.

It could be argued that the above presentation would have been welcome without television. This is perhaps a valid argument. Several departments hold their own in-service courses for graduate assistants. However, to the best of our knowledge, inter-departmental sessions on college level pedagogy have rarely if ever been on this campus, certainly not during the past ten years. The fact that faculty members could view the television presentation at their convenience without herding together in an auditorium, the fact that they could casually drop in a room to see a television presentation on a sensitive subject perhaps involving subtle issues of academic freedom may well have contributed to the favorable response. The fact that further subjects were suggested would indicate tacit approval of the method of presentation. Further, the demonstration by Professor Cagle could hardly have been made without using tele-

vision because of the many materials he integrated such as film clips, animated closeups of the test cards and printouts, etc.

In the words of Hypothesis IV, our faculty does "have a favorable attitude toward in-service training offered over television for voluntary use." They liked this program and they asked for more.

SUMMARY AND CONCLUSIONS

This study attempted to assess what would happen on a university campus if visual aids could be distributed by means of broadcast television. Inasmuch as the Federal Communications Commission has recently made available channels in the 2500 megacycle band for fixed multiple address, use of broadcast television for distributing visual aids is now readily possible.

Was there an increase in frequency of the use of visual aids by instructors having television as a visual aid? There was. Obviously, there would be an increase because television started from zero, and any use would be an increase. However, a comparison of the total use of visual aids by the experimental group and the control groups indicated that there was an increase in the use of all visual aids by instructors having television available, compared with instructors who did not. This cannot be a dogmatic assertion because the number of departments using television is still so small at this time and treatment groups so unbalanced that results are descriptive more than inferential. However, we know of no other non-chance factors, beyond the introduction of the low-power facility on the campus, which can account for the reported increase of use of visual aids by departments designated as "experimental" at the beginning of this study.

Does use of the low-power UHF broadcast television as a medium for distributing visual aids create more problems than are solved by such use? Those faculty members who used the television medium for distributing visual aids were uniformly positive that the television helped rather than hindered them in using visual aids, and in their overall teaching responsibilities.

Did teachers and students have a more favorable attitude toward television as a visual aid than as a medium for total instruction? This question was motivated by many studies which have indicated a negative attitude on the part of students toward television as a total teaching medium where all of the lecture material is presented on television. For comparative purposes, it was felt that attitude scales for this study should be capable of not only measuring attitudes toward total television and television as a visual aid, but also should permit measurement of attitudes toward the more traditional lecture method and the lecture method which utilized audio-visual techniques. A Thurstone

type scale for measuring attitudes was built. In a pretest before the project got under way, the faculty had a positive attitude toward all four methods of instruction although the lecture with regular audio-visual aids was significantly favored. The students had a favorable attitude toward three of the methods of instruction, but a negative attitude toward total educational television instruction. Thus, a measure of attitude before our project began supported the hypothesis that students and faculty would have a more favorable attitude toward television as a visual aid than as a medium for total instruction. However, we were also concerned with the kind of attitude change that would result. Three attitude tests were given to the faculty. A pre-test, a test in the middle of the project, and a test near the end of the project. No important attitude change took place in the faculty across the three planned periods.

An analysis of student attitude changes was easier to achieve. Students were divided into three groups: those who had no educational television instruction, those who had had lectures with television as a visual aid, and those who were taught by total educational television. The mean attitude scores of the non-exposed or control group were identical to the attitude scores of pretested students with no exposure to television. Those who were exposed to total television rated that method significantly higher than did the other two groups but did not rate television as a visual aid significantly different from lecture with traditional audio-visual aids. Those who were actually exposed to supplementary television rated the method significantly higher than did those who had not been so exposed. One can conclude that students who were exposed to a particular use of television showed an attitude toward that particular method that was significantly more positive than those students who had not been exposed. A further refinement of the data, a controlled analysis of the responses of students who were actually currently enrolled in a class using television, revealed that one of the groups exposed to supplementary television or television used as a visual aid gave it the highest attitude score, that is, ranking a lecture with television as a visual aid higher than any of the four methods of instruction. Thus, for the first time in our experience we found a television method rated the highest of all four teaching procedures. Actual exposure to the use of television, whether for total instruction or for supplementary use, obviously improves the student's attitude toward the medium. In general, we found complete support for the statement that teachers and students have a more favorable attitude toward television as a visual aid than as a medium for total instruction. Further, we found that if students are exposed to some form of television instruction, their attitudes toward the use of the medium improves.

Did college teachers have a favorable attitude toward in-service training offered over television for voluntary use? We approached this hypothesis with fear and trembling because of a university faculty's traditional hostility toward innovation in and examination of college teaching methods. The faculty was surveyed on its attitudes toward "informal faculty seminars on college level pedagogy." The questionnaire indicated that such subjects as learning theory, examinations, and to a lesser extent methods of presentation, might be well received. We chose to try a television program on examinations. Five per cent of the faculty watched the program and returned a questionnaire which was favorable. Indeed, other followups were suggested by many of the respondents. More subjective but perhaps significant was the fact that those of us on the television staff and the research project involved have not been needled by our colleagues for attempting to trod on sacred ground.

The most serious problems arising out of a project of this nature are administrative. The equipment performs well and the distribution of film and other visual aids via television is less cumbersome to the instructor than traditional methods.

The film library should be located at the same place as the television equipment. At the beginning of this project the Audio-Visual Bureau was located in the same building as the UHF facilities but during the second year the Bureau moved to a new building next door. Much greater effort had to be made to coordinate activities between the two organizations. Fortunately, there was excellent rapport among staff members which meant that problems were handled with a minimum of difficulty.

In future planning, the Audio-Visual Bureau and the television operations will be housed together. The Audio-Visual Bureau will have access to several film chains for distribution of materials.

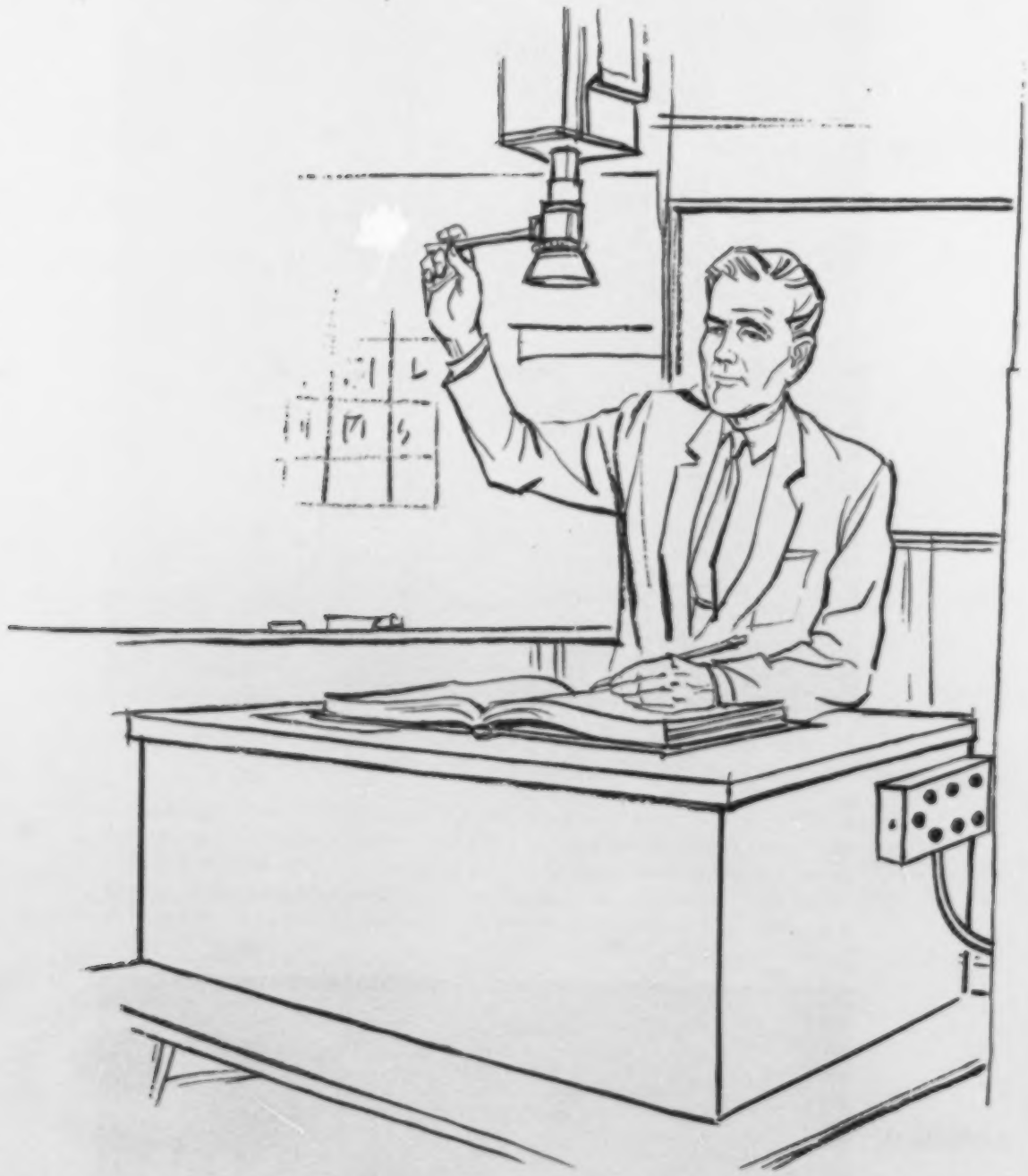
The inherent ubiquitousness of the broadcast facilities meant that we had little difficulty in getting a television signal into any building on the campus as needed. This ability was a great asset on many occasions when departments wanted service not anticipated when the project was conceived.

Suggestions for further study. As a direct result of this project, the new University of Utah Library, which will be built during the next five years, is planning extensive use of audio-visual aids including television and the traditional aids. A pilot project is under construction in the present library to test methods of using videotapes, kinescopes, films, and slides as one would use textbooks on reserve. The project professors are preparing "text films" and "text tapes" which will be put on reserve in the library the same as books. Stu-

dents will order these at the library, and the television materials and film will be distributed over the low-power UHF facilities.

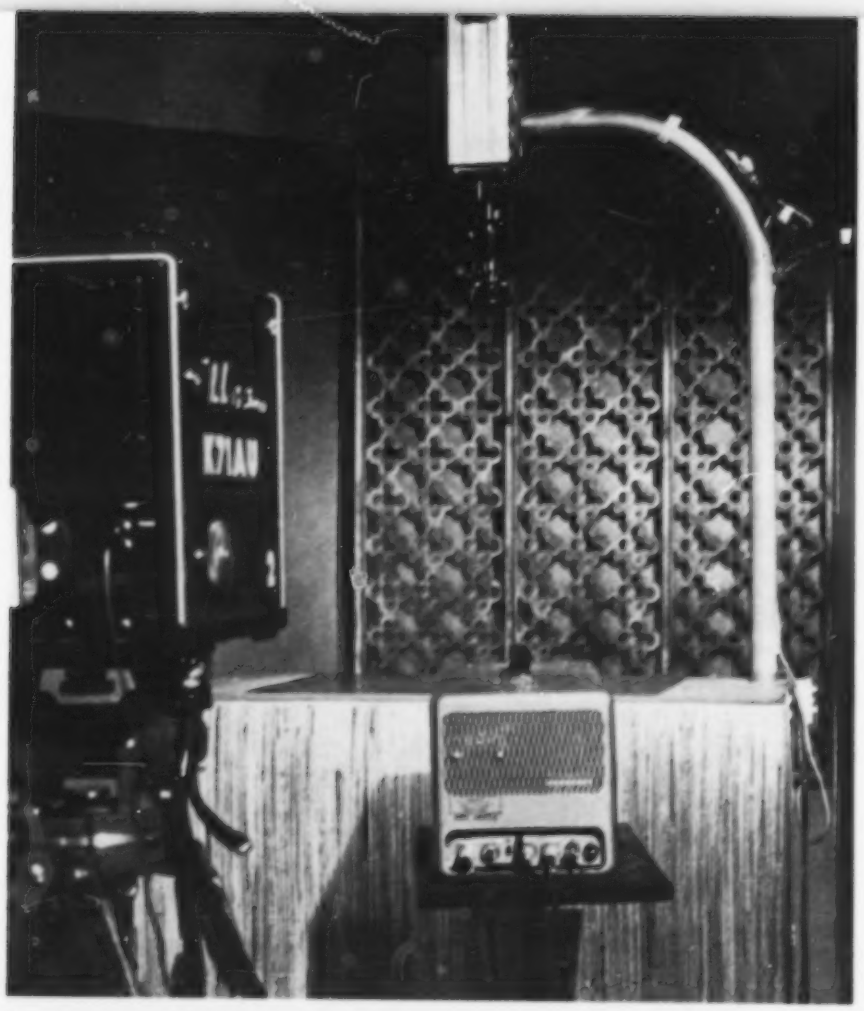
Perhaps the most fruitful area for further exploration is the matter of college level pedagogy. Apparently faculty members would be inclined to utilize presentations prepared by their colleagues on various aspects of teaching techniques on the college level. The ubiquitous distribution capability of the low-power UHF facilities coupled with all of the assets of television and film as presentational media should offer great promise in overcoming traditional faculty prejudice against innovation in college teaching.

The following is a highly subjective opinion, but is offered without apology. One of the intriguing new devices which is creating great interest on the University of Utah campus is a relatively low-cost videotape machine. As the library project mentioned above gets under way, we are finding that more and more professors wish to tape special demonstrations or reviews of material which students can consult for assistance in preparing for an examination. The old principle of involvement seems to operate here, for when the professor has been personally involved in preparation of a text film or a text tape, he seems much more inclined to have his students use the material than if he is provided some canned material from another source. Therefore, facilities which permit a professor to prepare his own television materials which later are distributed as a visual aid by means of television seem to be highly important in breaking down prejudices against such an innovation as television. A professor may be reluctant to participate in Continental Classroom because he is put in the role of a clerk, but if he sees himself as a Harvey White, his attitude is quite different.



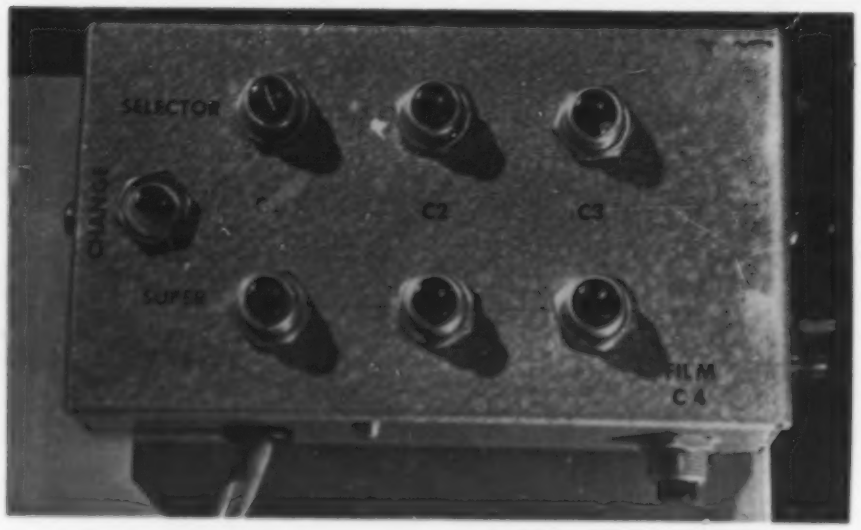
APPENDIX

FACILITIES AT
K71AU and K74AY



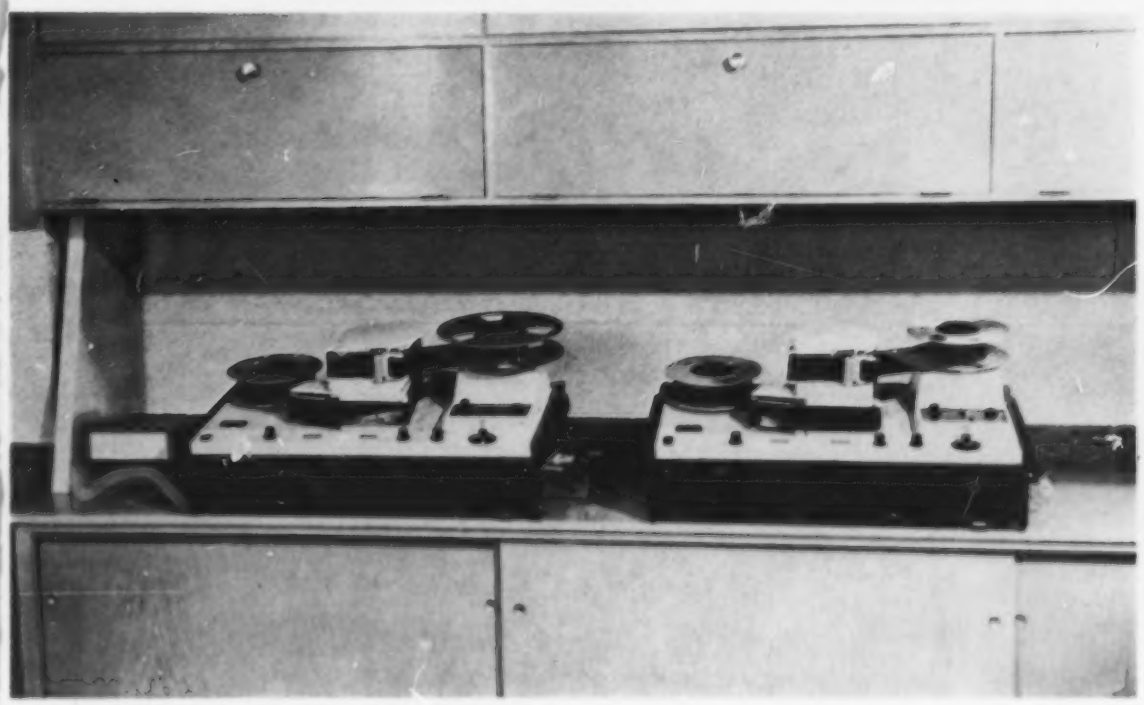
1. Instructor-directed TV console. Note instructor's switcher at right of console, and overhead camera with zoom lens.

2. Closeup of instructor's switcher. Top row of buttons is for cameras one, two, three. Lower row is a pre-set switcher which superimposes camera selected over camera on the selector row. The button denoted "Film C4" starts the film projector and automatically takes on the film chain after a three-second roll. The button marked "change" is to advance slides.



3. Film and slide projectors and film chain which may be used for preview of films via K71AU or playback in class.

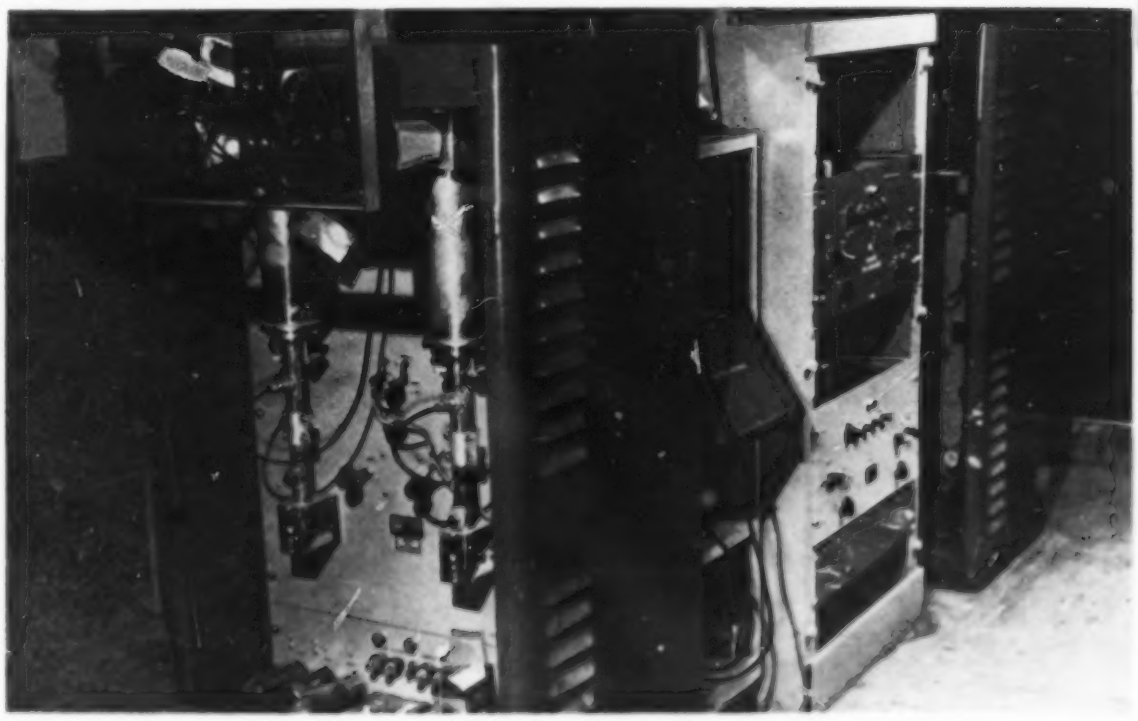
4. Videotape recorders. Recently installed, these machines in conjunction with the instructor-directed facility are stimulating many different kinds of uses for instructional television on the University of Utah campus.



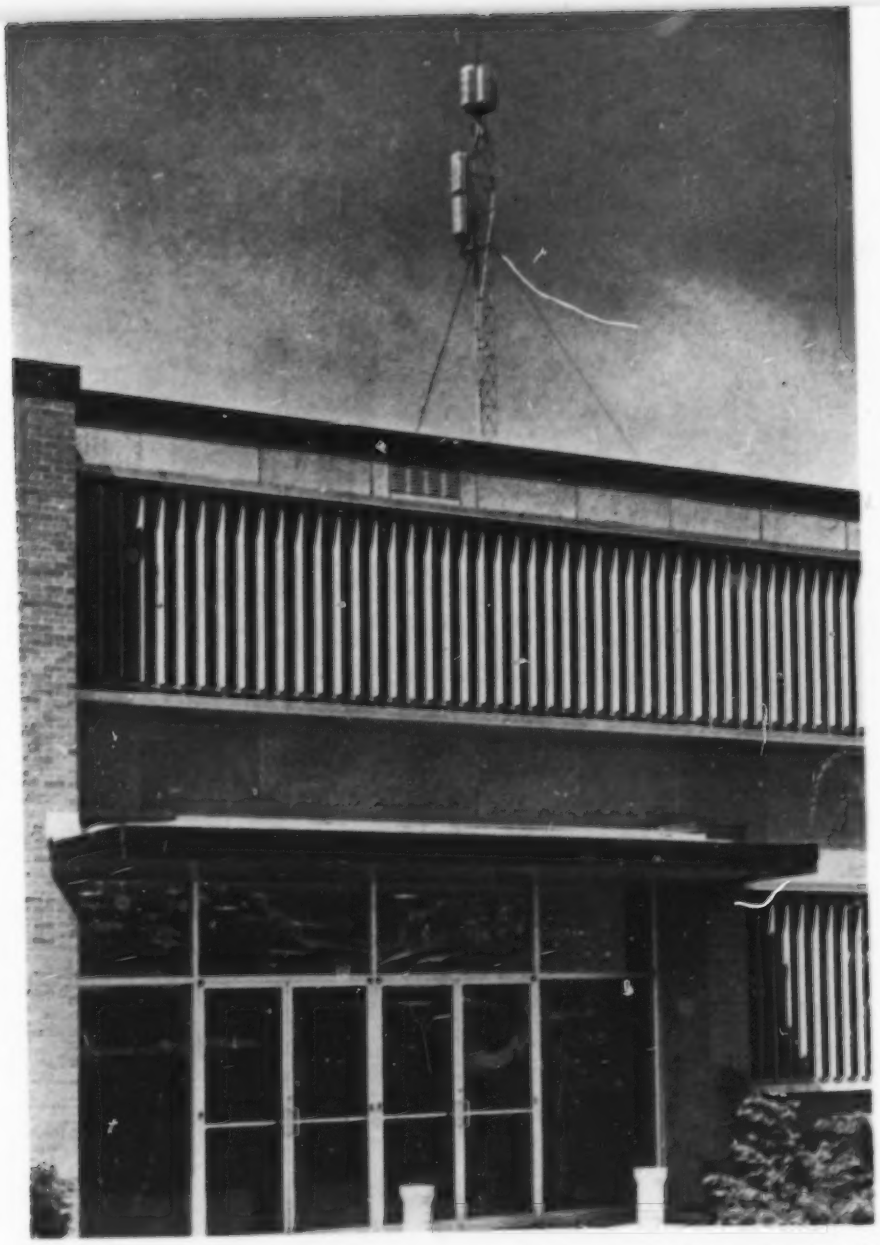
APPENDIX

5. K71AU control console with an effects amplifier capable of keying or splitting the screen.

6. Transmitters for K71AU in foreground and K74AY in background. Note the two drivers, channels 3 and 7, in middle rack.



APPENDIX



7. Transmitting antennae. Upper is omni-directional for K71AU with effective radiated power of 13 watts which provides usable signal up to a ten-mile radius. Lower is a directional for K74AY with effective radiated power of 55 watts which provides a usable signal up to 15 miles. Granite School District with 45,000 students has equipped every school to receive K74AY for programs presented by the district.

8. A faculty member previews film over K71AU.

9. A class sees a portion of a tape transmitted over K71AU.